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SFUND RECORDS CTR  
102634Authority AND 745077  
By MS NARA Date 9/11/98

C O P Y

RJN/gsb

*Encl to 13th Ind  
on B/X dated  
April 25, 1942  
cws 701/41*

May 20, 1942.

Subject: Ventilation and Solvent Recovery in Z. of I. Plant.

To: Chief, Arsenal Operations Department.

1. A survey of the Z. of I. Plant has been made with special reference to ventilation and solvent recovery. The survey included tests on solvent concentrations in the air throughout the plant and in the ventilating stacks, measurement of volume of air handled by the ventilating system, and an analysis of recent operating data.

2. Ventilation. a. On May 12 and 16, 1942, samples of air in the building and in the ventilating stacks were taken, and the solvent concentration determined as follows:

Sample No.	Place, Conditions	Volume, Time	Concentration (mg/l)	Parts per million
1	Between driers #2A-2B	135 l./5'	0.002	.29
2	In front of dryer 1/A, dryer open doors, windows open	135 l./5'	0.003	.43
3	In front of dryer 2-B, dryer shut doors, windows closed	135 l./5'	0.008	1.14
4	Mixing tank #1 manhole closed Doors, windows closed	135 l./5'	0.009	1.29
5	Mixing tank #1 manhole open	135 l./5'	0.006	.86
6	Mixing Tank pit	135 l./5'	0.003	.43

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Sample No.	Place, Conditions	Volume, Time	Concentration (mg/l)	Parts/million
7	Opp. intake valve To dryer	135 l./5'	0.001	.14
8	Final dryer 2-B doors open	135 l./5'	0.006	.86
9	Near cooling Table	135 l./5'	0.001	.14
10	Folding Table center of bldg.	135 l./5'	0.0007	.10
11	Folding table di-	135 l./5'	0.007	1.00
12	Baling press	135 l./5'	0.001	.14
13	Roof, south side	135 l./5'	none present	.00
14	Second floor, north	135 l./5'	none present	.00
15	Second Floor, south incoming material	135 l./5'	0.0007	.10
16	1st floor, dryer 3-A, closed	567 l./15'	0.009	1.29
17	Office	750 l./8'	0.002	.29
18	Second floor dryer -2	750 l./10'	0.0004	.06
19	#3-B impregnator open	750 l./15'	0.002	.29
20	Second floor #1-A impregnator, shut	750 l./10'	0.003	.43
21	Outdoors in pit side building	750 l./15'	0.004	.56
23	Inside dryer 3 A	263 l./10'	1.004 1.41	.56
24	Dryer stack (2' intervals)	250 l./1 hr		204.5
25	Impregnator, stack	250 l./1 hr	4.52	655.4
26	Hood stack	250 l./27'	.04	5.6

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Sample No.	Place, Condition	Volume, Time	Concentration (mg/l)	Parts/million
28	Chute stack	375 l./4l'	.16	22.4
29	Mix tank & cooling table exhaust	300 l./1 hr	.52	75.4

b. The highest concentrations of solvent in the air in the building is found to be in front of the final dryers, over the folding table and at the mixing tanks. Increased general ventilation, especially at these points, with removal of air at or near floor level is recommended.

c. The significance of the solvent concentrations in the ventilating stacks is shown in paragraphs 3b below.

3. Solvent Recovery. a. Due to various changes in operating procedure in the past, and the type of operating records maintained, estimations of recovery based on past performance are not entirely satisfactory. For the operating period May 1-11, more accurate records have been prepared, and while there is considerable variation from day to day, the average recovery of solvent over this period is found to be 59%. The actual inventory loss of solvent over the same period was 6100 gallons, equivalent to 16,600 gallons per month, having an approximate value of \$17,000 per month.

b. Tests on air flow and solvent concentrations in ventilating stacks gave results as follows:

Stack from	Cross Section	Air Velocity	Air Volume (c.f.m.)	Solvent Concentration (gm./l.)	Solvent Concentration (lbs./cu.ft.)	Total Solvent (lbs./min.)
Final Dryers	2.41 sq.ft.	5000 ft./min.	12100	1.41	0.000088	1.065
Impregnators	.95	6000	5700	4.52	0.000282	1.607
Hoods	1.99	5550	10930	.04	0.0000025	.0273
Chute	1.76	1500	2640	.16	0.00001	.0260
Mix tanks & cooling table	4.27	(3980)	(17000)	.52	0.000032	.540

Totals	48370	3.265
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Wt. of solvent per day =  $3.26 \times 60 \times 24 = 4700$  lbs.  
= 360 gals./24 hr. day  
= approx. .02 gals/lb. of clothing

c. The solvent loss shown by the above data is substantially less than the inventory loss above indicated (560 gals. per day). It is believed that the difference arises from the difficulty in obtaining representative samples from the ventilating stacks, unless taken over long periods. In any event it is obvious that essentially all of the solvent shown as inventory loss must be exhausted through the ventilating system.

d. The above data is of value in indicating the principal points at which loss occurs, namely the stacks from the impregnators and dryers, and to a lesser extent from the Table Exhaust. Considering the volume of air from the hoods and clothes chutes, and the small amount of solvent contained, it is questionable whether recovery from these stacks would be economical.

e. In view of the data presented in paragraph 3b, above, it is believed that immediate steps should be taken to cut down the losses of acetylene tetrachloride in the plant. Equipment similar in all respects except size to that originally installed in this plant has been operated with an overall recovery of more than 85% of the solvent used, and there is no reason why the Z. of I. plant equipment should not do as well or better. The losses from the impregnator are most excessive, and should be capable of being reduced to a small fraction of their present value. The original design provided for the withdrawal of air and vapor from each impregnator only when the cylinder is stationary and the door open. The present method of operation must facilitate the loss of solvent from the impregnator to account for the excessive quantities shown in paragraph 3b, above.

f. From the fact that the clothing contains excessive quantities of solvent when removed from the final dryers, it is apparent that these dryers are not performing as intended. It is understood that the dryers are being operated at a uniform temperature of 80°C. instead of in the manner prescribed in the plant operating directive. When properly operated, the dryers are capable of reducing the solvent content of the clothing to a very low value. It may be that additional condensing equipment may be required or that the use of activated carbon scrubber may be necessary to prevent the escape of excessive quantities of solvent vapor. However, it is believed that first consideration should be given to the possibility of obtaining better recovery with the present equipment.

M. E. BARKER  
Colonel, C.W.S.  
Chief, Research & Development Dept.

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